

# What can be done with a 100W Solar Panel in Mackinaw City

(Modified from Ever wonder what you can power with a 100W [solar panel?](#) )

<https://www.altestore.com/blog/2016/09/what-can-i-power-100w-solar-panel/>

The standard way to design a solar power system begins with deciding what to power, say a 45 watt, laptop computer. This will determine what size solar panel is needed. Alternatively, we can to look at the situation from the perspective of what can one power with a 100W solar panel?

## Power versus Energy

Both power and energy have to do with work. Power refers to the strength needed to do work. Energy refers to the amount of work being done. For example, to move a pile of dirt a given distance, it will take so much energy to move that pile, regardless of the time it takes to move it. If you increase the power, the work will be done faster, but the amount of energy used remains the same. If you increase the energy available you can move a bigger pile.

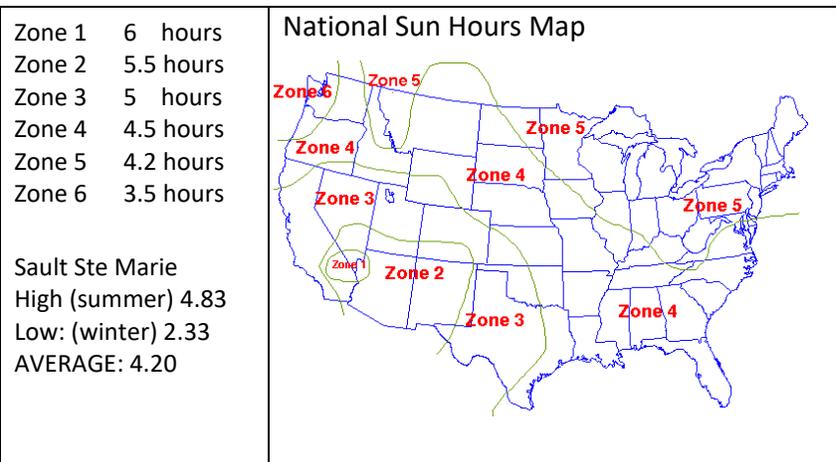
In electricity, the watt is a unit of power, and the watt hour is the unit of energy. For example a 12 watt LED light bulb requires 12 watts. In other words, the power source will have to deliver 10 watts to make the light work. The amount of energy (Watt hours) will determine how long can we run the light bulb. If we have 100 watt hours of energy we can run the light bulb for 10 hours.

## Ideal versus real power

A solar panel rated at 100W has the potential to run 10 ten watt LED light bulbs.<sup>1</sup> Although a solar panel is rated by the amount of power it creates under ideal conditions, the actual power depends on a number of other factors, including, the angle of the light hitting the panel directly, temperature, latitude, time of year and cloud cover. Thus, the actual power from the panel may be less.

To calculate how much power the solar panel will generate in a day is complicated by the fact that not all hours are equal in supplying energy to the panel. The sun at 9 am produces about half of the energy as the sun at noon. The amount of sunlight available in Florida is different from the amount of sunlight available in Maine. Cloud cover reduces the amount of power energizing

solar panels. Solar engineers use the term “sun hours” refers to the amount of solar energy is available on a given day taking in the variables of the time of year, latitude, cloud cover, etc., and have produced a sun hours map for the United States.<sup>2</sup>



<sup>1</sup> (Even though a panel may be designated as a 12 volt panel, it will put out 18 volts when operating at its maximum (5.5 amps))

<sup>2</sup> <https://www.wholesalesolar.com/solar-information/sun-hours-us-map>

For example, Sault Ste. Marie<sup>3</sup> averages 4.2 sun hours per day averaged over the year.<sup>4</sup> A 100W solar panel optimally positioned would provide 420 watt hours a day. In Miami FL, this panel would receive 5.2 sun hours a day and produce 520 watt hours a day on an annual average. Given the longer summer days in Michigan, the Sault Ste. Marie panel will produce more power than its Florida counterpart.

### **How much power can 100W solar panel produce?**

For the installation at Heritage Village, we would want its peak power for the summer months. This would mean pointing directly at the sun in midsummer. Given the slant of the Plank House roof is at approximately the optimal angle, we can place the panel directly on the roof of the Plank House. Using the Sault Ste. Marie data for summer sun hours of 4.83, our 100W solar panel would give us 483 watt hours. To allow for losses (say 30%), let's say the actual power is actually 338 watt hours of power available each day.

### **Increasing the power availability with a battery and a charge controller**

By using a battery this energy can be stored and used later and a charge controller is needed to manage putting the power into the battery. A deep cycle battery, also known as a marine battery is one that is designed (unlike a car battery) for continuing usage and can be charged and discharged on a regular basis.

A charge controller needs to be large enough to handle the current of the solar panel. A 12 volt/100W solar panel produces 8.3 amperes of current, so a charge controller needs to be this size or larger.

Battery capacity is measured in ampere hours rather than watt hours. To convert the watt hours to ampere hours, divide the watt hours by the voltage of the battery. Thus to store 338 watt hours in a 12 volt battery, we need a battery size of 28 ampere hours. To play it safe, a battery should have twice the capacity of a the daily charge, so that an ideal capacity would be 56 ampere hours.<sup>5</sup>

### **What work can 338 watt hours do?**

To find out the length of time you can run a device on this system, simply divide the device's watt rating into 338.

<b>Device</b>	<b>Power Rating</b>	<b>Hours of daily use</b>
12 Volt LED light bulb	12 watts (100 watt equivalent)	28 hours
Laptop Computer	45 watts	7.5 hours

<https://www.wholesalesolar.com/solar-information/sun-hours-us-map>

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<sup>3</sup> The nearest data point to Mackinaw City.

<sup>4</sup> with a high of 4.83 sun hours and a low of 2.33

<sup>5</sup> There are some other considerations such as battery temperature, that we won't go into now.